FUNCTIONAL COATINGS FOR THE REDUCTION OF OXYGEN PERMEATION AND STRESS AND METHOD OF FORMING THE SAME

Abstract of the Disclosure

The oxidation behavior of the bond coat is improved using a HVOF nanostructured NiCrAlY coating. NiCrAlY powder is mechanically cryomilled and HVOF sprayed onto Ni-based alloy to form a nanocrystalline bond coat. Oxidation is performed on the coating to form the thermally grown oxide layer (thermally grown oxide). After heat treatment at 1000 °C for 24 and 95 hour, a homogeneous α-Al_2O_3 layer is formed on top of the bond coat. The nanostructured characteristic of the coating and the presence of Al_2O_3 within the cryomilled powders (oxidation occurred during cryomilling process) affects the nucleation of the alumina layer on the top of the coating. The formation of a continuous thermally grown oxide layer protects the coating from further oxidation and avoids the formation of mixed oxide protrusions, such as those presented in the coating sprayed using the as-received powder.